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Post-Disaster Rescue Archaeological Investigations, Evaluations and Interpretations in the Kathmandu Valley World Heritage Property (Nepal): Observations and Recommendations from a UNESCO mission in 2015

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1. Introduction

The two major earthquakes that struck Nepal on the 25th April and the 12th May 2015 were a human catastrophe, devastating large areas of the country and neighbouring regions, leading to substantial loss of life, livelihoods as well as post-disaster physical and mental trauma. This natural disaster and its associated aftershocks also generated a cultural catastrophe, damaging and destroying parts of Nepal's unique cultural heritage, including monuments within the UNESCO Kathmandu Valley World Heritage Site of Universal Outstanding Value (Figure 1). Not only beautifully ornate Temples of wood, brick and tile, the monuments of the Kathmandu Valley represent a major source of income and economic growth through international and national tourism and are a key component of Nepal's fragile economy as one of the country's major sources of foreign currency. Furthermore, these sites play a central role in the daily lives of thousands of Nepalis, representing portals where the heavens touch the earth and where it is possible for ordinary people to reach out and commune with their guiding goddesses and gods – they are of intangible value.

For these reasons, the damaged heritage sites of Nepal are currently being subject to a major program of consultation, reconstruction and conservation. As part of this post-disaster phase of evaluation, Durham University, in close cooperation with the Department of Archaeology, Government of Nepal and under the overall authority of the UNESCO Representative to Nepal, was requested to carry out a post-disaster urban archaeological investigation, evaluation and interpretation mission in the Kathmandu Valley UNESCO World Heritage Property between 5th October and the 22nd November 2015. This included recording damage to archaeological heritage at the three major Durbar Squares of Hanuman Dhoka, Bhaktapur and Patan and developing recommendations for post-disaster archaeological responses in the Kathmandu Valley and Nepal. The following observations and discussions are based on a report produced for UNESCO and the Department of Archaeology immediately following our mission in 2015 (Coningham et al. 2015a).

2. Damage to the Subsurface Archaeological Heritage of the Kathmandu Valley during the Post-Earthquake Emergency Phase

Whilst our mission focused on recording damage within Hanuman Dhoka, Patan and Bhaktapur Durbar Squares from the natural disaster, we soon became aware that additional damage to monuments and subsurface remains from human agency had occurred during the post-earthquake emergency phase. For example, although the surviving standing remains of the Char Narayan and Vatsala Temples were largely left untouched during the immediate Emergency Phase, this did not occur at Kasthamandap. One of the most historic and celebrated monuments of the Kathmandu Valley, the Kasthamandap had hosted a blood donation clinic on the 25th April 2015 so that when it collapsed, it caused a devastating loss of life. We have identified that the substantial damage to the foundations of the structure and its floors is almost entirely directly attributable to the humanitarian efforts to recover the injured and dead from the brick, clay, tile and timber debris from the collapse of its superstructure (Coningham et al. 2016a).

Observers noted that the army dispatched a bulldozer within the first hour of the collapse to assist with the recovery and that two JCBs had been deployed to the site the following day as the recovery efforts continued (Figure 2). During these two days, the outer foundation walls of the Kasthamandap on the south, southwest and southeast were destroyed and the inner walls damaged along with large portions of the monument's tile pavement. Temporary shelters were then erected by nearby residents on the levelled mound of debris and, at a later stage, a dry brick wall on the south, southwest and southeast sides of the Kasthamandap was constructed in order to retain the loose brickbat, tile and clay debris above the ruins. Timbers from the site were removed with two of its major pillars and one of its cross-beams being placed under a tarpaulin beside the eastern side of the Navadurga Temple. The location of the other two major pillars remains unknown. The two main broken parts of the image of Gorahknath were removed from the site, with one portion stored within the

Hanuman Dhoka Palace precincts and the other transported to the National Museum, raising questions as to whether two parts of the same object should be stored in different locations.

Elsewhere across the Valley, there was a general drive for the swift demolition of particularly badly damaged or partly collapsed monuments (Weise 2015: 16). For example, army personnel demolished badly damaged stone monuments within the complex of the Pashupati Area Development Trust in the weeks following the first earthquake in order to minimise potential loss of life in the event of additional earthquakes or powerful aftershocks. This is a major concern as much of this demolition was undertaken without the recording of architectural elements and involved the dumping of debris without recording or thought to its potential reuse within reconstruction. Indeed, there has been strong advocacy to reconstruct utilising modern engineering designs and materials without archaeological assessment first. However, as will be outlined below, structural assessment has been conducted at some monuments in the post-Emergency Phase but without recording, systematic analysis, archaeological assessment and, in most cases, without publication.

3. Damage to the Subsurface Archaeological Heritage of the Kathmandu Valley World Heritage Site between the Emergency and Reconstruction Phases

The superstructure of the Char Narayan Temple collapsed during the earthquake of the 25th April, although its foundation platform was undamaged during the Emergency Phase immediately following the two earthquakes on 25th April 2015 and the 12th May. When we first visited the Temple within Patan Durbar Square at Lalitpur, it was immediately apparent that major subsurface investigations had been undertaken prior to our arrival. Indeed, there were three open trenches, including one on the uppermost plinth of the Temple cutting at least five metres down into its foundations. Furthermore, deep boreholes around the Temple had been drilled by contractors, Pashupati Drilling and Geotechnical Services, on behalf of the Kathmandu Valley Preservation Trust (KVPT). Subsequently, we were provided with the Final Technical Report of the borehole drilling, which identified the aim of the investigations to gather general information on the site, the stratification of subsoil, the bearing capacity of soil pertaining to settlement and shear and, finally, liquefaction analysis of the temple sites (Pashupati Drilling and Geotechnical Services 2015: 1).

Their investigations had involved the drilling of four 15 metre deep bore holes at the four corners of the Char Narayan Temple, as well as the Harishankar Temple, and included the subsequent laboratory analysis. The subsoil was investigated and sampled with a percussion drill and observations recorded at every 1.5 metre interval. Only the north-west and south-east bore holes at the Char Narayan Temple are recorded as having yielded cultural material within the top 1.5 metres (*ibid.*: 6), although it is highly likely that the samples from

the north-east and south-west bore holes contained redeposited packing materials. At the site water table seepage was recorded at a depth of five metres in the boreholes (ibid.: 7). Amongst the study conclusions, two of the more relevant notes stated that “no more archaeological ruins are found beyond 1.5m depths” and that “only brick bats and sandy silts could be seen upto (sic) the existing foundation depth” (ibid.: 14). This unpublished technical report, which was dated July 2015, only reported on the results of the bore holes. The report did not refer to the cutting of the trenches into the Char Narayan Temple platform, although we understand that these were also commissioned by the KVPT. It is apparent that this historic monument was damaged during this process and that no attempt was made to record the archaeological materials recovered or encountered and no sieving of the extracted soils. At the time of our mission, these trenches were still open, presenting an additional danger to the fragile wall foundations thus exposed (Figure 3). It was one of our recommendations that the trenches should be backfilled as soon as possible.

Furthermore, between the submission of our recommendations report to UNESCO and the Department of Archaeology in December 2015 and a site visit to Patan in May 2016, we noted that the foundations of the Mani Mandapa had been intrusively dug into (Figure 4). This intrusive activity had removed paving around the base of the brickwork of the monument that stood above the current pavement level and had also dug out the soil fill around the brickwork of the foundations. This soil fill had survived the collapse of the monument during the earthquake of 2015 and was not at risk, but the undocumented digging has now led to the loss of archaeological information and the destruction of subsurface heritage. We again stress the need to protect collapsed monuments and their foundations from unchecked and unrecorded interventions, and to ensure that such remains are not left open and susceptible to further damage.

The interventions in Patan were not the only unrecorded exploratory excavations within the Kathmandu Valley World Heritage Site as we were also able to observe a trench cut alongside north facing wall of the Degutale Temple in Hanuman Dhoka Durbar Square. Measuring approximately two by one metres, the trench was cut below an area where a portion of the outer brick facing of the Temple had collapsed. Cut by workmen on the instructions of the Engineering Section of the Department of Archaeology soon after the earthquake, no plans or sections were recorded at the site and no report of the findings submitted to the Archaeology Section of the Department of Archaeology. Although access was restricted by the scaffolding and shoring above, the one metre deep section demonstrated the presence of subsurface archaeology. At the time of our mission, it was noticeable that the trench was still open, presenting an additional danger to the fragile wall foundation thus exposed (Figure 5). As with the open trenches of the Char Narayan Temple, we recommended that this trench should be backfilled as soon as possible.

During our investigations at Kasthamandap in October and November 2015, we were also able to identify two additional examples of unrecorded damage to the subsurface archaeological heritage of Hanuman Dhoka. The first of these involved the work of engineering contractors, R.S. Associates of Kathmandu, who sampled part of the Square using a percussion drill for the Engineering Section of the Department of Archaeology (R.S. Associates 2015). The drilling was conducted in order to “characterise the subsurface conditions of the site, to evaluate the bearing capacity of foundation soil and to recommend safe bearing capacity for different type of foundation including settlement analysis and the potential of liquefaction” (ibid.: 2). The two bore holes were both drilled to a depth of 15 metres, the former being located at the southern edge of the rubble mound of the Kasthamandap and the second to its north-east. It is surprising that neither of the two Bore Hole log sheets encountered any cultural material but it may be that such material was not the focus of the study. It is also notable that the report clearly states that “the water table was not found” within either of the 15 metre deep bore holes (ibid.), although water was encountered at the bottom of the trench within the Kasthamandap by the excavation team (Coningham et al. 2016a). This water may be explained by seepage from the mains water pipe, which was damaged by R.S. Associates’ Bore Hole 1. It is recommended that this damage is repaired as it will be an almost constant source of subsurface water in the vicinity of the monument’s foundations, as well as being an inconvenience to local inhabitants.

The second intervention was associated with the erection of new solar lights within the Durbar Square. In one of the observed cases, workmen from the Municipality cut a trench measuring two by one metres through the brick pavement of the Square adjacent to one of the historic monuments. Despite encountering a large stone slab and brick within the metre deep trench, the workmen completed their work without archaeological supervision or recording of the subsurface archaeology, inserted the new lamp and concreted it in place (Figure 6). Note should also be made of the movement of traffic within two of the main Durbar Squares, Hanuman Dhoka and Bhaktapur. Whilst in Bhaktapur, the Durbar Square was opened to traffic to due to debris blocking routes through the city elsewhere, and although the effect of the vibrations from traffic is uncertain, it is unwise to allow heavy vehicles pass close to a number of the fragile surrounding monuments, many of which are supported with timber struts. Such traffic, which includes heavy water trucks should be controlled and, wherever possible, stopped until the buildings are consolidated (Figure 7).

Beyond the Durbar Squares, reference should be made to the emergency interventions undertaken by UNESCO with the Department of Archaeology at Swayambhu on the Tashi Goluma Stupa, also known as the Tashi Gomang and Mangal Bahudvar (Andolfatto 2015). Begun on the 1st May 2015 and completed before the monsoon, a press release from UNESCO on the 25th May 2015 stated that: “An exciting discovery happened while studying what remained of the Tashi Gomang Stupa (called Mangal Bahudvar Chaitya in Sanskrit). This unique white plastered stupa with multi-tiered niches adorning votive sculptures is to the

southwest of the Swayambhu Stupa. On closer inspection it was found that there was another stupa inside with sculptures in terracotta. The terracotta sculptures closely resemble those found at Mahabouddha, Patan so it is preliminarily thought that the sculptures could be from a similar timeframe. The discovery of the inner chaitya could also indicate the practice of adding layers creating a multi-shell structure, something characteristic of larger mahachaityas, to also be true in this unique smaller stupa. Several other artefacts were also found in the ruins, which are now kept in a secure location” (UNESCO 25/05/2015).

We are at present unable to evaluate the nature of this intervention or its findings as the Department of Archaeology had not been provided with detailed technical reports of the intervention in May 2015, whilst the activity report of May 2015 states that “Considering the short time allowed by the coming of the monsoon, we decided to start excavating it without drawings. Instead pictures are taken when relevant elements are found” (Andolfatto 2015: 1). Our mission recommended that no further interventions are undertaken prior to the submission of a detailed technical report of this emergency activity, especially archaeological activities that are not designed for the evaluation of damaged structures and subsurface heritage prior to reconstruction. Finally, reference should also be made to the recent dismantling of the entire brick tower of the Bauddhnath Mahachaitya in November 2015 (Weise 2015: 43). Although not related to subsurface heritage, this process was undertaken by the Bauddhnath Area Development Committee without detailed recording of construction and materials from within the tower was dispersed to pilgrims with no degree of research recording undertaken (Figure 8).

4. The Archaeological Heritage of the Kathmandu Valley World Heritage Property

These observations illustrate the additional damage to heritage in the Kathmandu Valley World Heritage Property post-disaster, during the Emergency Phase and also in the following months. Beyond the damage caused to the superstructures of monuments during the earthquake, it is regrettable that much of the damage was seemingly avoidable. Whilst damage to the surviving remains of Kasthamandap was undertaken for humanitarian efforts, the majority of other interventions have been taken in non-emergency circumstances, when time could have been afforded to detailed and careful systematic recording of heritage. Indeed, much of the post-disaster response has focused on the rebuilding and examination of these remains without thought for the sub-surface heritage. However, it should be recognised that plans to swiftly reconstruct temples on existing platforms will necessitate interventions and excavations to establish evaluate the strength of the foundations of collapsed monuments. Detailed recording and scientific analysis of these interventions is critical as almost none of the published architectural studies of the monuments of the Kathmandu Valley contain plans or sections of foundations.

Indeed, such interventions should be accompanied by archaeological excavations in order to evaluate the sub-surface stability of the platforms as well as evaluate and sequence evidence for prior structures in that locality. Furthermore, the necessity of undertaking additional soil testing as well as the replacing of sewerage, water mains and even street lights will further threaten the vulnerable subsurface archaeological heritage underlying contemporary configurations of courtyards, Durbar Squares and streets. This heritage has already been damaged immediately after the earthquake during the emergency phase as well as more recently in the post-disaster pre-reconstruction phase and we should remember that it is also encompassed within the Kathmandu Valley's OUVs, in particular, "The cultural traditions of the multi ethnic people who settled in this remote Himalayan valley over the past two millennia, referred to as the Newars, is manifested in the unique urban society which boasts of one of the most highly developed craftsmanship of brick, stone, timber and bronze in the world" (UNESCO 02/12/2015).

Whilst the structural integrity of future constructions and reconstructions requires analysis of foundations, from a historical viewpoint such recording of subsurface heritage is also critical as whilst the standing architecture of Kathmandu, mostly attributed to the period of Malla rule within the Kathmandu Valley (fifteenth - eighteen centuries CE), has been the focus of many years of documentation and research (e.g. Gutschow 1997 and 2011, Korn 2007 and 2014, Hutt 1994), in comparison very little is known of the presence or nature of earlier cultural phases, particularly subsurface archaeological heritage. For example, recent excavations at Lumbini and Tilaurakot have uncovered timber structures below brick remains in early cultural sequences (Coningham et al. 2013, Coningham et al. 2016b, Davis et al. 2016, Strickland et al. 2016), indicating that non-durable buildings were succeeded by durable monumental architecture. Such a scenario is highly likely in the Kathmandu as the presence first millennium CE Licchavi inscriptions across the Kathmandu Valley (Amatya 2011, Joshi 1974, Regmi 1983, Mirnig 2013, Tiwari 2001), suggest a deep sequence, significantly earlier than the present architectural standing remains. Many scholars also seek prototype linkages for Kathmandu's sikara temples within the plains of Northern India, such as to Bodhgaya (Basukala et al. 2014), rather than making reference to the earlier examples within the Nepali Terai (Mitra 1972). Furthermore, there is still debate as to the antiquity and ancestry of Kathmandu's multiple-roofed temples (e.g. Banerjee 1980) as well as the uncertain chronological sequencing of the standing buildings, which have survived to this day – certainly, our new dates for the Kasthamandap suggest a date of at least the of the seventh century AD for this style.

This situation is of grave concern as few archaeological excavations have targeted the identification of earlier subsurface archaeological evidence within the medieval sites of the Kathmandu Valley despite the very real threat to their survival, not only from natural disasters such as the recent earthquake, but also from the pressures of rapid urbanisation and associated development. Archaeological excavations have been conducted at Harigaon (Veradi

1992) Dumakhal (Khanal and Riccardi 2007), Pashupati (Di Castro 1997) and Patan (TPU 2003a, 2003b) but these excavations have been limited in focus, although in some instance they have illustrated the potential of earlier archaeological sequences below visible standing architecture. Furthermore, in some instances, full publication of archaeological investigations is still awaited, such as at Pashupati (Di Castro 1997). This is also the case for excavations of Patukadwon in Patan, traditionally thought to be the site of the Kirati Palace (TPU 2003a, TPU 2003b). In addition, there has yet to be a systematic scientific dating programme of archaeological sequences within the Kathmandu Valley and most scholars rely on chronicles, surviving inscriptions and loose architectural typologies for our understandings of the development of this unique society and architecture. Fieldwork at Pashupati by the current team has begun to establish a programme for developing systematic excavations, including scientific dating linked to developing artefactual sequences, within a multidisciplinary approach that integrates scientific archaeological investigations with textual narratives (Coningham et al. 2015b and 2016e), but such studies are in their infancy. Furthermore, we still know little as to the history of the development of the Kathmandu Valley's Durbar Squares from an archaeological perspective and whether these medieval centres were pre-planned from antiquity or were relatively late innovations, resulting from opportunistic clearance of earthquake damaged structures.

5. Archaeological Risk Mapping in the Kathmandu Valley

Our mission piloted such an approach, developed earlier during the UNESCO sponsored fieldwork in Lumbini's Sacred Garden. The combination of Ground Penetrating Radar survey (GPR) with excavation has facilitated the development of provisional Archaeological Risk Maps for the three main Durbar Squares of the Kathmandu Valley. Whilst the results of the surveys are discussed elsewhere (Coningham et al. 2016a, 2016c, 2016d), the premise of Archaeological Risk Mapping will be outlined here.

Archaeological Risk Maps highlight those areas where archaeological vestiges, both on the surface and below the surface, are at risk from development. Using a traffic light system of Red, Yellow and Green, these designated areas come with recommendations for site managers and planners on how to guide the subsequent physical planning and development within a site:

Red 'High Risk'

These areas contain the most important archaeological remains at the site and are of significance not only for understanding the development of a specific Durbar Square, but also the wider Kathmandu Valley and beyond. There should be no further development in these areas, and any existing modern structures should wherever possible be removed.

Yellow 'Moderate Risk'

These areas contain (or may contain) archaeological remains that can inform us about the development of a specific Durbar Square. Development in these areas should be kept to a minimum, in accordance with an Archaeological Watching Brief.

Green 'Low Risk'

These areas contain minor or no archaeological remains, which may be able to inform us about the development of a specific Durbar Square. Development in these areas is possible, but should be undertaken in accordance with an Archaeological Watching Brief.

It is recommended that the archaeological risk maps based on the results of the initial GPR surveys and excavations should be used to guide and aid future subsurface interventions within the three Durbar Squares, including the repair of below ground infrastructure damaged by the earthquake. Our interventions clearly illustrate the need to investigate and protect subsurface heritage across the Kathmandu Valley World Heritage property. Therefore, post-disaster assessments require strong guidelines and legal protection in order to protect standing and subsurface heritage during this period of rehabilitation and construction, and for preparedness in light of the likelihood of future natural disasters as well as unchecked development.

6. Post-Disaster Planning, Guidelines and Policy with respect to the Subsurface Archaeological Heritage of the Kathmandu Valley World Heritage Site

In this context of vulnerability and damage, it is critical that awareness is raised as to the risk to the Kathmandu Valley's subsurface archaeological heritage. In light of this, the *Post Disaster Needs Assessment*, draft *Conservation Guidelines for Post 2015 Earthquake Rehabilitation: Conservation Guidelines 2015* and UNESCO's *Nepal Post-Earthquake Rehabilitation of Cultural Heritage Phase 2: Planning and Research Report* were reviewed.

6.1 The Post Disaster Needs Assessment

The *Post Disaster Needs Assessment* (PDNA) was completed on the 10th June 2015 by the Department of Archaeology and UNESCO Kathmandu. The PDNA estimated the damage to Nepal's heritage at about US\$169 million with an associated loss of US\$23 million from damage and impact on livelihoods (PDNA 2015: 1). It was designed to provide a preliminary

description of the resultant cultural and heritage damage and loss from the 2015 earthquake as well as to provide “an initial assessment of short, medium, and long-term intervention needs, adopting a “building back better” approach.” (ibid.). The PDNA’s third section provided an assessment of disaster effects on infrastructure and physical assets and recorded that a total of 691 buildings of historic value in 16 districts were effected, with 560 damaged and 131 destroyed (ibid.: 3). It concludes by identifying a six-year recovery period during which the restoration and reconstruction of damaged and collapsed historic buildings will be completed, including refurbishment of cultural institutions and museums (ibid.: 9). With costs at an estimated US\$34 million per year, it is further recommended that the recovery plan “should include substantial support to the Department of Archaeology in financing necessary equipment and additional professional staff” and listed the following expert areas: structural and seismic engineering, architecture, conservation, curation and museum design, anthropologists, ritual specialists, art historians, linguists, ethno-musicologists, etc. (ibid.). Furthermore, the PDNA strongly advocated the provision of “extensive training at all levels of project planning and restoration implementation” and that “Educational support also needs to be provided for advanced studies in conservation-related professions” (ibid.). Further detail was provided as to required numbers of professionals to be engaged in assisting the current staff of Department of Archaeology with the recruitment of 10 Project managers, 10 Civil Engineers, 8 Conservation Architects, 10 Surveyors/Draftsmen, 5 Accountants, 5 Office assistants and 2 Archaeologists (ibid.: 15).

Focused on standing monuments and intangible heritage, there is no reference to the vulnerability of subsurface archaeological heritage of the Kathmandu Valley World Heritage Property or the need to study and scientifically analyse the foundations of monuments. This absence is concerning as the report notes that there has already been a shift in urban development programs from preservation to "modernization" with increasing pressure on providing basic intrusive infrastructure, such as electricity and water supplies (ibid.: 4). Furthermore, reference needs to be made to the comment on anticipated “bottlenecks in the supply of timber and special bricks used for restoration” as huge numbers of bricks and tile were removed from the historic sites and dumped in various localities around the Valley following the clearing of collapsed monuments. Finally, one might find the low count of archaeologists requested within the document’s scope as an additional low priority for safeguarding the subsurface heritage of Kathmandu.

6.2 Conservation Guidelines for Post 2015 Earthquake Rehabilitation: Conservation Guidelines

In view of the paucity of references to the subsurface archaeological heritage of the Kathmandu Valley UNESCO World Heritage Site within the PDNA, there is a parallel paucity within the draft *Conservation Guidelines for Post 2015 Earthquake Rehabilitation: Conservation*

Guidelines 2015 (CGPERCG2015). Initiated by the Department of Archaeology, the stated aim of the Conservation Guidelines is “to address the issues of conservation of the monuments throughout the country” with consideration “both to the earlier conservation practices and possible improvisation and the recommendations from the experts have been incorporated” (ibid.: 1). The document is laudable in that it recognises the need for rescue excavations, unlike the PDNA, and defines it as “rapid archaeological activity carried out on sites where the new construction has been proposed however the necessity of the archaeological investigation in that site has also been felt.” (ibid.: 2). However, in view of the significance and vulnerability of the Valley’s subsurface archaeological heritage, it is recommended that the document also encompasses guidelines relating to these subsurface remains, including monument foundations. Such considerations should be included in Heritage Impact Assessments, with intrusive developmental interventions preceded by a watching brief and, if necessary, rescue archaeology, with excavations that include detailed recording and scientific analysis. Furthermore, these guidelines should include provisions for archaeological watching briefs, where an archaeologist monitors the excavation of foundation and service trenches, landscaping and other intrusive works across Durbar Squares and adjacent to monuments in cases when the presence of subsurface heritage could not be established in advance of development. In such a watching brief, if needed, the watching archaeologist will signal to interested parties when an archaeological find has been made in order for a rescue excavation to be commenced.

In terms of reconstruction, the document provides detailed guidelines for the steps that should be taken. These include detailed research of available documentation, with the monument reconstructed in its original form by reusing as much of the original salvaged materials as possible in their original location and function, with no reconstruction allowed on pure conjecture. We also support the guidelines that state that the monument should retain its original structural system, which should only be improved if there is valid justification, especially the statement that any foreign materials introduced, should not be intrusive and reversible considering its performance over time. From our investigations, specifically at the Char Narayan Temple (Coningham et al. 2016c) and the Kasthamandap (Coningham et al. 2016a), we also agree that monument foundations should be retained as far as possible and should only be strengthened or replaced if there is valid justification. However, we believe that if any intervention is required this should only be conducted after rescue excavations. Whilst the document stresses that major interventions at damaged and collapsed monuments will be intrusive, and that this is an opportunity to carry out appropriate research, we stress that such appropriate research includes rescue archaeology, which will aid the aim of improving knowledge of these historic structures, as well serving for the basis of planning conservation and restoration initiatives.

6.3 Nepal Post-Earthquake Rehabilitation of Cultural Heritage Phase 2: Planning and Research Report

Reference should also be made to UNESCO's *Nepal Post-Earthquake Rehabilitation of Cultural Heritage Phase 2: Planning and Research Report* (Weise 2015). With the aim of providing "an overview of the planning and research phase of the post-earthquake rehabilitation of cultural heritage in Nepal" (ibid.: 5), relevant sections will be discussed here. The Phase 2 report correctly identifies post-disaster research as an integral part of rehabilitation and reinforced this statement by illustrating what little we actually know about the impact and response to the 1934 earthquake. The report also stresses that the research must be designed and carried out in "a way so as to ensure that the outcome can be used for practical purposes in planning the rehabilitation. This means that focus of the research must be on gaining better knowledge of issues that are key in rehabilitation. The research format would therefore also need to ensure the relevant outcome and reporting so as to be able to use this in the planning process. The research would also need to provide the scientific justifications for conservation procedures." (ibid.: 16). We are in agreement with the report's identification of the need for urban archaeology to evaluate "the discussion of the stability of the foundations of the monuments that collapsed" in the light of "a frantic endeavour to push towards the general demolition of the ancient foundations and reconstruct based on modern engineering designs" (ibid.: 17). The report also recognises that "archaeological research in and around the damaged monuments especially at the Durbar Squares would firstly provide information on the chronology of how the Squares developed possibly with dating of specific components. The research would also need to provide information on the status of the foundations with possible added structural assessments to aid in the design of reconstruction of the collapsed monuments" (ibid.).

7. Discussion and Recommendations

In light of our observations, and having discussed challenges and opportunities with professionals and stakeholders, it is clear that the current focus on the rehabilitation of architectural superstructures has resulted in additional damage to Kathmandu's World Heritage site. This has largely gone unnoticed as it entailed damage to subsurface archaeological heritage, even though this heritage is protected by national legislation and is part of the Outstanding Universal Value of the Kathmandu Valley World Heritage Site. Whilst emergency interventions have badly damaged some buildings, driven by recovering the injured and dead, much damage relates to non-emergency activities, including engineering contractors cutting exploratory trenches and drilling soil cores, workmen cutting foundations, the deliberate collapsing of monuments and engineers dismantling others. All of these events had a common absence of in-situ archaeological recording and the absence of prior consultation with professional archaeologists. The lack of engagement with subsurface heritage is paralleled in the *PDNA 2015*, which fails to note the risk to the vulnerable subsurface archaeological her-

itage from rehabilitation and reconstruction activities. More recent documents, such as the draft *Conservation Guidelines for Post 2015 Earthquake Rehabilitation: Conservation Guidelines* (CGPERCG2015) recognise this risk but need further strengthening. Furthermore, the programs of research identified within the '*Nepal Post-Earthquake Rehabilitation of Cultural Heritage Phase 2: Planning and Research Report*' (Weise 2015), including development of urban and rescue archaeology and material analysis, should be supported by UNESCO and the Department of Archaeology, Government of Nepal prior to the commencement of monumental reconstruction and rehabilitation. It is worth noting that this situation is shared across South Asia and there is a very real capacity deficit for urban and rescue archaeology, despite being located in a region both prone to risks from seismic events and risks from the impacts of rapid urbanisation.

Our mission has successfully demonstrated the presence of subsurface archaeological heritage within each Durbar Square and their current configurations represent an organic development (Coningham et al. 2016a, 2016c, 2016d). It is clear that intrusive activities will damage subsurface archaeological heritage, whether for sewers, water pipes or new foundations for old monuments. This is not to recommend the suspension of services and reconstruction but to advocate the mobilisation of rescue archaeology teams to undertake rescue excavations in advance of interventions. Furthermore, these interventions should be guided by Archaeological Risk Maps, provisional ones of which are available for the main Durbar Squares of Patan, Hanuman Dhoka and Bhaktapur and should be produced for further monument zones with priority for those in need of reconstruction. It would be a second cultural catastrophe if the subsurface heritage of the Kathmandu Valley was destroyed in the rush to reconstruct the collapsed and damaged architectural heritage of the 2015 earthquakes.

Indeed, in the Durbar Squares, our GPR surveys have illustrated the presence of subsurface archaeology and we recommend that additional areas are surveyed. Resultant Archaeological Risk Maps can then guide future interventions. Having identified earlier phases of construction, it is recommended that additional rescue excavations are conducted to provide structural sequences and architectural plans to illustrate the character and development of these monuments, linked to a program of geoarchaeological analysis and scientific dating. Having demonstrated the complexity and vulnerability of the subsurface heritage of a stone sikhara-style temple (Coningham et al. 2016d), a timber structure (Coningham et al. 2016a), a medium-sized brick temple (Coningham et al. 2016c), it is recommended that other categories of site are investigated, including stepped temples, Buddhist complexes, monasteries, residential quarters and vernacular architecture, city walls and gates. Such investigations will provide a better understanding of their foundations and thus inform reconstruction and the use of traditional technologies as well as the developments of these key monumental classes within the Kathmandu Valley. In relation to this, the earthquakes and post-disaster responses, have highlighted the need to design and deliver awareness raising program introducing the subsurface archaeological heritage of Kathmandu, rescue and urban archae-

ology and the practicalities of urban planning and watching briefs. This could assist the development of a South Asian-wide capacity in rescue archaeology to respond to regional cultural disasters and emergencies. This training should be conducted by specialists in urban archaeology and the field archaeology of South Asia and should be supported by multidisciplinary experts.

Following on from this, our mission has also demonstrated that despite the wealth of expertise on Kathmandu's architectural superstructures, little was known about their foundations. We have identified strengths within traditional design, and we strongly advocate the reconstruction of these monuments using traditional techniques wherever possible but only after rescue excavations and with trained archaeologists conducting watching briefs during reconstruction. Our observations, particularly at the Kathmandap, highlighted the strength of traditional foundations within this active seismic region. Indeed, historical sources, some corroborated by analysis of soil stratigraphies, which have identified some non-documented seismic events, suggest major earthquakes in c. 1100 CE, 1224 CE, 1255 CE, 1260 CE, 1344 CE, 1408 CE, 1430 CE, 1681 CE, 1767 CE, 1803 CE, 1810 CE, 1823 CE, 1833 CE, 1869 CE and also more recently in 1916 and 1934 CE (Gautam et al. 2015 1-3, Mugnier et al. 2013, Sapkota et al. 2013, Schwanghart et al. 2015) and the foundations have survived many of these catastrophic events. At the Kathmandap, we observed that the foundations of the monument were resilient and undamaged by the 2015 earthquakes or previous seismic events and the collapse of many monuments may be linked to superstructure maintenance issues. Indeed, at this monument, some architectural elements, such as saddlestones to lock in supporting timber pillars, were missing and some wooden pillars were also missing key features such as interlocking tenons (Coningham et al. 2016a).

It should be noted that the principles that have guided the construction and monuments in the Kathmandu Valley have included cyclical renewal, which has been implemented due to the twin exposure of these structures to earthquakes and damp. An in-depth discussion of this, as well as issues of authenticity and conservations and reconstruction, is outlined within the document arising from the International Symposium held in 2013 *Revisiting Kathmandu: Safeguarding Living Urban Heritage* (UNESCO 2015). Foreshadowing many of the issues that have affected Kathmandu's post-earthquake historic urban environment in 2015, it discusses how traditional techniques have been developed to cope with these risks, particularly exposure to earthquakes. Whilst we have noted issues with poor superstructure maintenance, the design of structures in the Himalayan region have inherent elements of seismic engineering adapted within their designs (ibid.: 14). Therefore, if the technology is available and sympathetic to the existing heritage, it should be utilised. Indeed, in terms of the authenticity of the Kathmandu Valley World Heritage Property, it is stated that "The authenticity of the property is retained through the unique form, design, material and substance of the monuments, displaying a highly developed traditional craftsmanship and situated within a traditional urban or natural setting. Even though the Kathmandu Valley has

undergone immense urbanization, the authenticity of the historic ensembles as well as much of the traditional urban fabric within the boundaries has been retained". Furthermore, in the future, even if this seismic durability is compromised, there is a greater ability to rescue those trapped and recover bodies from traditional architecture by hand, especially when compared to concrete structures, which require heavy machinery, much of which cannot reach structures located within narrow streets and confined spaces. In light of this debate, and at this critical stage of planning, structural analysis and research now needs to be undertaken on traditional technologies, as identified within the *Nepal Post-Earthquake Rehabilitation of Cultural Heritage Phase 2: Planning and Research Report* (Weise 2015) in order to establish the capacity of the materials within historic foundations.

Although discussed within our original report, a topic which we have not touched on within this article is the management of debris from monuments damaged by the earthquakes. Whilst there are critical philosophical and ethical debates surrounding the appropriate treatment of debris in a post-disaster environment, at the present time, priority should be given to cataloguing the quantities of stored timbers, stone fragments and terracotta objects, with conservation work undertaken once this is completed. Materials should be catalogued using a standardized numbering system on a standardized worksheet which can be digitized on a central online database that the Department of Archaeology, UNESCO, and municipalities can access but with editorial access restricted to a single co-ordination team. Looking forward, it is important that emergency response plans consider the removal of debris, and its classification, more clearly. Plans should establish clearer chains of decision-making, define the responsibilities and provide guidelines regarding the treatment of heritage materials at different stages of the post-disaster response. Identifying major and alternative storage spaces would also contribute to debris management and the organisation of the recovery of building materials which can then be reused avoiding potential production bottle necks during reconstruction.

Finally, taking a broader perspective, it should be noted that many World Heritage monuments around the globe have been damaged by human conflicts and natural disasters, leading to the creation of emergency preparedness and response protocols as well as the mobilisation of ICOMOS and UNESCO teams. Whilst many aspects of these protocols relate to planned responses, the physical treatment of debris and the use of rescue archaeology to investigate the stability of foundations in such situations are less well defined. Whilst a human and cultural catastrophe, UNESCO's involvement in Kathmandu's post-disaster environment has the potential to offer invaluable training for professionals in the scientific documentation and recording of in situ debris, Archaeological Risk Mapping and structural sub-surface foundation recording in advance of reconstruction and rehabilitation. The resultant exemplars, supported by research into traditional construction technologies and the reuse of materials, provide the potential to offer robust methodologies and techniques to those

tasked with the clear up and subsequent research, rehabilitation and rebuilding of damaged heritage globally, particularly in the Middle East.

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Figures

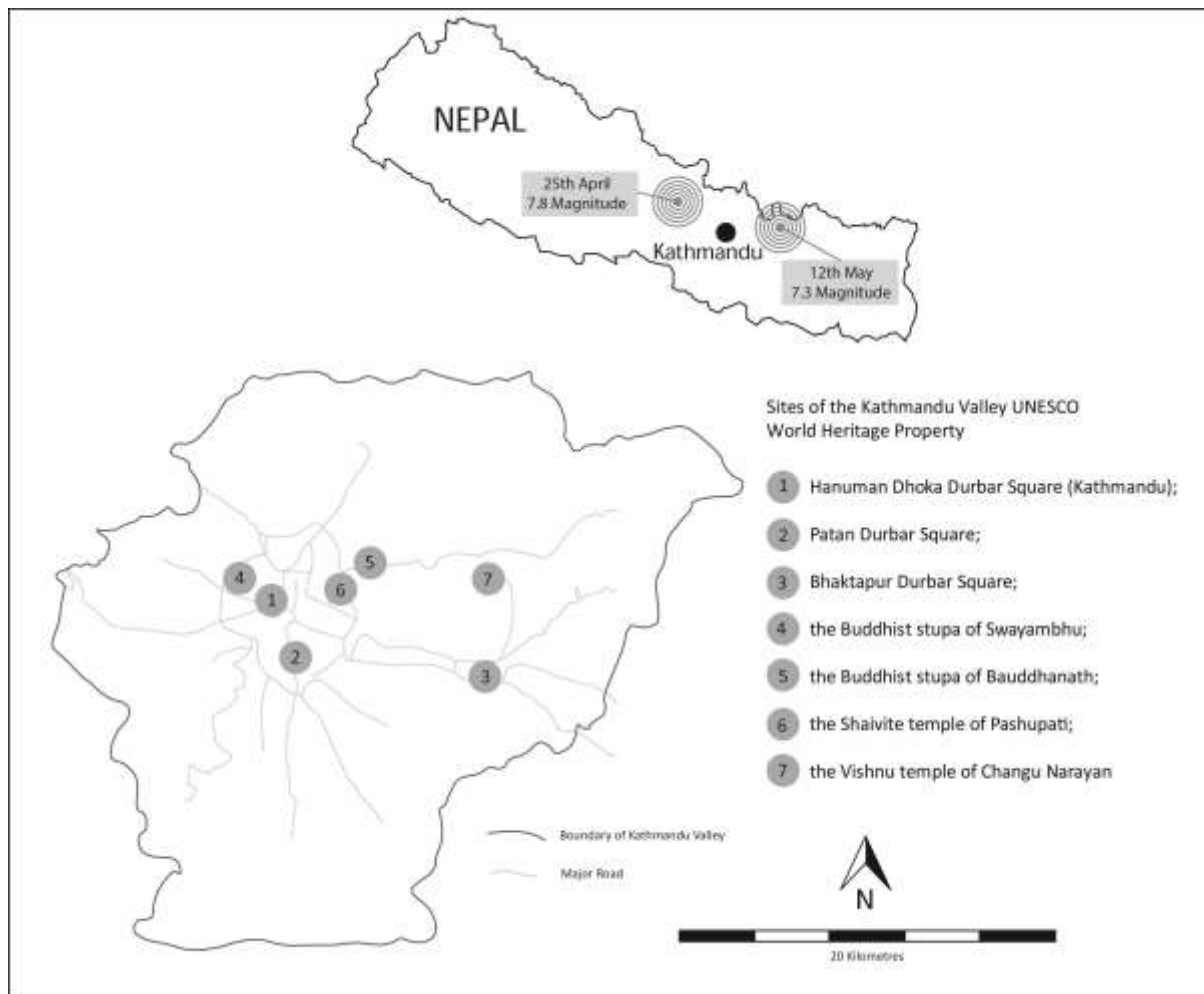


Figure 1: Location of Earthquake epicentres, Kathmandu Valley and the sites of the UNESCO Kathmandu Valley World Heritage Property.



Figure 2: JCBs clearing the debris at Kasthamandap on the 26th April 2015 (Image courtesy of Kai Weise).



Figure 3: One of the unrecorded trenches opened on behalf of KVPT located on the lower plinth on the west of the Char Narayan Temple. Photographed in October 2015.



Figure 4: The collapsed Mani Mandapa in Patan, photographed in October 2015 (left) and May 2016 (right) illustrating unrecorded excavation of the foundations.



Figure 5: Unrecorded excavation trench cut alongside north facing wall of the Degutale Temple in Hanuman Dhoka Durbar Square. Photographed in October 2015.



Figure 6: Unrecorded cut adjacent to a temple platform in Hanuman Dhoka Durbar Square for the installation of a lamppost.



Figure 7: Heavy vehicle passing through the main Durbar Square at Bhaktapur. Photographed in October 2015.



Figure 8: Image of the Baudhnath Mahacaitya after the unrecorded removal of the brick tower. Photographed in November 2015 (Image Courtesy of Mildred Davis)